

THAT WHICH IS CLAIMED IS:

1. A method, comprising:

purifying a phenol product stream, wherein said phenol product stream comprises phenol and a first concentration of a contaminant by-product of a process for making phenol derived from sec-butyl benzene, by contacting, under suitable reaction conditions, said phenol product stream with an acidic catalyst to thereby convert at least a portion of said contaminant by-product to a reaction product.

2. The method of claim 1 wherein said first concentration of said contaminant by-product is in the range of from about 3 ppmw to about 10,000 ppmw, and the amount of phenol in said phenol product stream is in the range of from 95 weight percent upwardly to about 100 weight percent of said phenol product stream.

3. The method of claim 2 wherein said contaminant by-product is hydroxybutanone.

4. The method of claim 3 further comprising:

yielding a treated phenol product stream having a second concentration of said contaminant by-product that is lower than said first concentration of said contaminant by-product.

5. The method of claim 4 wherein said second concentration of said contaminant by-product is less than 3 ppmw.
6. The method of claim 5 wherein said acidic catalyst is selected from the group of materials consisting of zeolites, ion exchange resins and aluminas.
7. The method of claim 6 wherein said suitable reaction conditions include a contacting temperature in the range of from about 50°C to about 250°C, a contacting pressure in the range upwardly to about 100 psig.
8. The method of claim 1 wherein said suitable reaction conditions include a contacting temperature in the range of from about 50°C to about 250°C, a contacting pressure in the range upwardly to about 100 psig.
9. The method of claim 8 further comprising:

yielding a treated phenol product stream having a second concentration of said contaminant by-product that is lower than said first concentration of said contaminant by-product.
10. The method of claim 9 wherein said contaminant by-product is hydroxybutanone.
11. A method of purifying a phenol product stream, wherein said phenol product stream comprises phenol and a concentration of hydroxy butanone, said method comprises:

contacting said phenol product stream with an acid catalyst; and

yielding a purified phenol product having a reduced concentration of hydroxy butanone.

12. The method of claim 11 wherein said concentration of hydroxy butanone is in the range of from about 3 ppmw to about 10,000 ppmw and the amount of phenol in said phenol product stream is in the range of from 95 weight percent upwardly to about 100 weight percent of said phenol product stream.
13. The method of claim 12 wherein said contacting step is conducted under reaction conditions including a contacting temperature in the range of from about 50°C to about 250°C and a contacting pressure in the range upwardly to about 100 psig.
14. The method of claim 13 wherein said acid catalyst is selected from the group of materials consisting of zeolites, ion exchange resins and aluminas.
15. The method of claim 14 wherein said reduced concentration of hydroxy butanone of said purified phenol product is less than said concentration of hydroxy butanone of said phenol product stream.
16. A method as recited in claim 15 wherein said reduced concentration of hydroxy butanone of said purified phenol product is less than about 3 ppmw.

17. A method, comprising:

obtaining a phenol product stream derived from a mixed feed of cumene and sec-butyl benzene, wherein said phenol product stream includes a concentration of a contaminant;

contacting under purification conditions said phenol product stream with an acid catalyst; and

yielding a purified phenol product.

18. The method of claim 17 wherein said contaminant is an aliphatic hydroxy carbonyl compound and said concentration of said contaminant exceeds 3 ppmw.

19. The method of claim 18 wherein said purification conditions include a contacting temperature in the range of from about 50°C to about 250°C and a contacting pressure in the range upwardly to about 100 psig.

20. The method of claim 19 wherein said purified phenol product contains less than 3 ppmw of said contaminant.

21. The method of claim 20 wherein said phenol product stream includes phenol in an amount exceeding 99 weight percent of the phenol product stream and said contaminant is hydroxy butanone.

22. A method of making a high purity phenol product, said method comprises:

subjecting a mixed feed comprising cumene and sec-butyl benzene to oxidation conditions to yield an oxidation reaction product comprising sec-butyl benzene hydroperoxide and cumene hydroperoxide;

subjecting at least a portion of the sec-butyl benzene hydroperoxide and cumene hydroperoxide of said oxidation reaction product to decomposition reaction conditions to yield a cleavage reaction product comprising phenol, acetone, and methyl ethyl ketone;

separating said cleavage reaction product into at least a phenol product stream and another product stream wherein said phenol product stream comprises at least a portion of said phenol of said cleavage reaction product and a contaminant by-product; and

contacting under suitable purification reaction conditions said phenol product stream with an acid catalyst to thereby convert at least a portion of said contaminant by-product to a reaction product.

23. The method of claim 22 wherein said acid catalyst is selected from the group of catalyst materials consisting of zeolite compounds, cation exchange resins and aluminas.
24. The method of claim 21 wherein said contaminant by-product includes hydroxy butanone.

25. A purified phenol product, comprising:  
phenol derived from sec-butyl benzene, wherein said purified phenol product has a non-contaminating concentration of a contaminant.
26. The purified phenol product of claim 22 wherein the amount of phenol is in the range of exceeding about 99 weight percent of said purified phenol product, and wherein said contaminant is an aliphatic hydroxy carbonyl compound, and wherein said non-contaminating concentration of said aliphatic hydroxy carbonyl compound is less than about 3 ppmw of said contaminant.
27. The purified phenol product of claim 23 wherein the amount of phenol is in the range exceeding 99.8 weight percent of said purified phenol product and wherein said non-contaminating concentration is less than 1 ppmw.
28. A phenol product, comprising:  
a sec-butyl benzene derived phenol product having been purified by treatment with an acid catalyst.
29. A high-<sup>PURITY</sup>~~priority~~ phenol composition, comprising:  
phenol derived from sec-butyl benzene containing less than about 3 ppmw hydroxybutanone.
30. A system for treating a phenol product stream containing a concentration of a contaminant, said system comprises:

*[Signature]*  
1/21/04

a reactor defining a reaction zone wherein contained within said reaction zone is an acidic catalyst and phenol.

31. A purified phenol product manufactured by any one of the methods of claims 1-21.